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Abstracts

Education

Program/Abstract # 74
Animations as supplemental resources for biology course
Jack D. Thatcher
Structural Biology Division, WV School of Osteopathic Medicine, Lewisburg, WV, USA

Computer animations are becoming prevalent as text book inclusions, websites and instructional CDs. How should these be incorporated into courses? A series of animated lessons have been composed as visual aids for the Developmental Genetics course at WVSOM. To evaluate these animations as supplemental resources, students were provided with the animations during the course, and asked to fill out a questionnaire when the course was over. Thirty one students from the classes of 2009 and 2010 participated in the study. The proportion of subjects who used the animations was 31%, while 16% studied the majority of the files, and 57% thought the animations saved study time. Interestingly, 12 times more subjects devoted the majority of their study time to handouts. They also rated the handouts higher than the animations, although the difference was not significant. Experience with animations, handouts and lectures increased the number of subjects preferring each, while no one was left preferring the textbook. Before and after the conducting the study, the greatest preference was for all four media, followed by handouts, then lectures, then animations. To directly compare animations to handouts, candidates from the class of 2012 are being mailed a representative animation and handout. The preliminary results suggest that the animation is as effective as the handout. These results suggest that animations are a valuable supplemental resource for many students, but not for everyone, and caution should be exercised with efforts to replace traditional teaching methods with digital animations.

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Program/Abstract # 75
A seminar that introduces freshmen to biology research and researchers
Dereth R. Phillips, Andrew W. Woodward, Bonnie Bartel
Department of Biochem. and Cell Biol., Rice Univ., Houston, TX, USA

Research universities have numerous scientific resources at their disposal, but they often struggle to engage potential undergraduate biology majors. To remedy this problem, we have developed a freshman seminar to provide early exposure to biology, familiarize young students with cutting-edge research and researchers, and encourage undergraduates to participate in research projects. The course, Freshman Seminar in Local Biology, is taught in sections of 5-8 students to provide an intimate, personal atmosphere, more reflective of the social environment in which scientific research is performed than the standard large introductory science classes. Each section is led by a graduate student or postdoctoral instructor. We have developed an extensive instructor manual and provide in-depth training for the section leaders as they develop lesson plans and student assessments. Each section explores a different research paper published by a featured local laboratory at Rice or in the adjacent Texas Medical Center (TMC) complex. Tours of the lab where the section leader works, the lab that published the section's featured article, and several labs in an off-campus TMC department are integrated into the course. The tours allow hands-on observation as well as interaction with the researchers—professors, graduate students, and undergraduates—who conducted the research that was studied in the classroom. In the first year of teaching the course, evaluations from students and section leaders have been overwhelmingly positive. More details can be found on the course website: www.bioc.rice.edu/bios115. (This work is supported by an HHMI Professor grant to BB.)

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Program/Abstract # 76
Engaging undergraduates in the scholarship of discovery using a *Drosophila* deficiency screen
Margaret C. Bloch-Qazi
Department of Biology, Gustavus Adolphus College, St. Peter, MN, USA

Guided undergraduate research experiences teach the process and content of science in an integrated way. They have the added incentive of generating novel insights into biological phenomena allowing students to experience the joys inherent in the scholarship of discovery. Students in an upper level undergraduate research course used *Drosophila melanogaster* to conduct a deficiency screen with the goal of identifying novel gene regions influencing female sperm storage, a developmental process. Female sperm storage consists of sperm retention in specialized locations within the female reproductive tract and is an essential reproductive step for many animals. In one semester, students screened two deficiency lines for phenotypes consistent with a failure to store sperm normally. They used FlyBase to identify the genes uncovered by their deficiency and identified human homologues of these genes. Finally, they wrote papers in which they proposed models describing the actions of candidate genes on the process of sperm storage. This work allowed them to explore topics in experimental design, genetics, development, and bioinformatics. It

also allowed students to explore their roles as scientists engaged in original research.

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Program/Abstract # 77
Introducing undergraduates to zebrafish development and genetics in a large Introductory Biology laboratory
Allison D'Costa [a,b], Iain Shepherd [a]
[a] *Department of Biology, Emory University, Atlanta, GA, USA*
[b] *Division of Science and Tech., Georgia Gwinnett College, Lawrenceville, GA, USA*

We have taken advantage of the strengths of the zebrafish model system, transparent eggs and rapid development, to introduce developmental genetics to undergraduates in their second semester of the Introductory Biology course. A 6-week laboratory module was designed based on current research, use of modern techniques and bioinformatics, and a case study that makes a connection to a real-life situation. Students learn the stages of development while observing "live" development in a petri dish, then use techniques such as whole-mount *in situ* hybridization and staining with a vital dye to screen for mutants, and finally study the effect of various pharmacological agents on development. These labs engage the students by providing a hands-on, research-centered experience, while also enhancing their written (worksheets and laboratory reports) and oral (group presentation) communication skills. The length of the module gives students sufficient depth on the topic to tweak their interest and think about pursuing upper level courses and research in developmental genetics. We describe the proceedings of each lab, the logistics of preparing and running these labs for 400–500 students (120 students taking lab each day) and provide preliminary assessment data based on student evaluations.

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Program/Abstract # 78
Teaching the toolkit: a laboratory series to demonstrate the evolutionary conservation of metazoan cell-signaling pathways
Elizabeth E. LeClair
Department of Biological Sciences, DePaul University, Chicago, IL, USA

A major finding of comparative genomics and developmental genetics is that metazoans share certain conserved signaling pathways that instruct cells as to their ultimate fate. Because the DNA encoding these pathways predates the evolutionary split of most animal groups, it should be possible to clone representatives of such signaling pathways from almost any species, demonstrating their sequence conservation. Here I describe an 8-week laboratory series that tests this prediction by attempting to clone multiple members of a known signaling pathway from a species where the targets are unknown. Beginning with the molecular components of a signaling pathway and publicly available sequence information from related taxa, students designed partially degenerate PCR primers to amplify the corresponding mRNA sequences from a "new" organism, in this case a turtle (*Trachemys scripta*). Using a single round of degenerate PCR and standard DNA cloning techniques, we were able to retrieve 6 out of 16 species-specific homologs on the first attempt (~40% success rate). To conclude the project, students submitted the novel, partial sequences back into the original public database (GenBank); the clones could be further used in Northerns, 53 ¢ RACE, or in situ hybridization. The molecular methods of these labs can be adapted to any combination of pathway and organism, demonstrating the conserved components of cellular signaling from gastrulation to aging. The linked labs offer intensive research-based training in bioinformatics and molecular biology, while empirically demonstrating the ubiquity of the metazoan cell-signaling toolkit.

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Program/Abstract # 79
A Developmental Biology/Medical Ethics undergraduate learning community: a novel approach to explore value-laden social and ethical issues related to developmental biology
Kristin R. Douglas [a], Daniel E. Lee [b]
[a] *Biology Department, Augustana College, Rock Island, IL, USA*
[b] *Religion Department, Augustana College, Rock Island, IL, USA*

At Augustana College, a learning community is defined as a set of two courses from different areas of study that are thematically linked. The two courses are planned and taught in coordination with each other while the same cohort of twenty-five students is enrolled in each course. All Augustana students are required to complete a learning community prior to graduation. The "Ethics and New Technologies in the Life Sciences" learning community included a developmental biology course offered by the Biology Department and a medical ethics course offered by the Religion Department. While the disciplinary content covered in each 300-level course was rigorous in and of itself, students were exposed to an added level of complexity as the content of the learning community courses was woven together. Students were challenged to reconcile their scientific and moral/ethical viewpoints as they completed inquiry projects in assisted reproductive technologies, stem cell therapies, and independent research projects covering a variety of topics. The learning community model allowed faculty to deliberately expose students to social and ethical issues with no clear-cut answers. Students had the benefit of examining issues both through the lens of a developmental biologist and an ethicist. While some students changed their opinions on value-laden topics, most students reported an increased understanding of the complexity of the issues covered in the learning community.

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Program/Abstract # 80
Opportunities to present your successful teaching and outreach experiences at SDB meetings and website
Ida Chow
Society for Developmental Biology, USA

Have a teaching or a science education outreach project that you are proud of? Why not share it with your peers? Education is a major goal of the Society for Developmental Biology's mission (www.sdbonline.org) and all members are invited to actively participate in the many opportunities available for sharing and learning. The Professional Development and Education Committee is chaired by Dr. Bill Wood; it oversees these activities and welcomes your suggestions and volunteering. We would like to specifically invite you to submit your education projects to our peer-reviewed digital library, Library of Educational Annotated DEvelopmental biology Resources (LEADER), a branch of the Bioscience Education Network